

Received Database – General Comments

The data recently provided by the Navy contains a significant amount of information, and we appreciate the effort to put that together. However, the information is not presented in a uniform “working” digital format where all data from a specific date range and all well/sampling locations within that range can be directly extracted. For instance, if we wanted to plot groundwater elevation data for all available point in the 3rd quarter of 2015, we could not do that with the information provided. Further explanation follows below.

The 3 DVDs comprising “the database” contains 3 folders, some containing subfolders. Within these folders are contained approximately 4493 files which includes 1418 PDF files, 289 TXT files, 112 EXCEL files, numerous CSV files, a large number of GIS files, a single Microsoft Access database (extension “.accdb”), and geodatabase files.

The access database contains five tables, one of which contains information regarding the database format, and four of which contain data. The data tables contain sample results and water levels. The data tables are all text fields (i.e., do not appear to contain numeric fields for quantitative data analysis). The database does not contain a single comprehensive well construction, completion or location table to which all sampling/gauging data can be linked. The database does not appear to contain external links to other files or data sources. The database does not appear to contain any queries for retrieving data in usable formats.

The EXCEL and TXT files collectively appear to contain groundwater level data (or hyperlinks to groundwater level data); pumping rate/flow data, and other information that is not contained within the single Microsoft Access database. These data are not available in a unified synoptic format from which date and location data can be queried (Matt, is this correct?).

The geodatabase contains a collection of feature classes, many of which represent publically-available information that has been obtained independently. The contents of the geodatabase fall under the following categories:

- Digital Elevation Models (DEMs): three different DEMs of Oahu are included in the geodatabase. Resolution varies between the DEMs from 1 m 230 m per pixel.
- Aerial Photography: Two georeferenced aerial images published by the USGS from 4/5/1952 and 1/5/1978
- Geological data: six polyline or polygon features that are digitized elements of a geologic map. Geologic data includes surficial geology, traces of dikes and faults, sediment thickness contours, ash contact traces, and contours of the “top of volcanics.”
- Hydrology data: seven polyline or polygon features that delimit aquifer extents, streams, Red Hill groundwater model extent, and the USGS estimates for average and drought condition recharge by spatial location.
- Hi Res surface elevation tiles, derived from a lidar survey conducted in 2013.
- Parcel data (polygons of parcels)

The PDF files include stratigraphic logs and well construction logs, in addition to published reports and other documents. Matt: did you find the recent detailed logs they showed in one of their recent presentations that included all the fracture analysis detail & geophysical logs?

We are coming to a juncture where the groundwater modeling results will need to be more closely vetted by the agencies. We would like the Navy to post its draft calibrated model layers/packages to an FTP site or other dynamic location where the agency experts can access the model to compare with site data sets noted below.

Finally, the agencies do not have comprehensive documentation of the 27,000 gallon release in 2014. How was that volume estimated, what is the uncertainty, what were the lapses in the tank monitoring & maintenance system that were responsible for the release occurrence? This can be a brief summary document covering each of these aspects and any others the Navy believes relevant.

Database Content and Design Suggestions

The following describes what was anticipated to be included in the project database when the request was made of the Navy by the regulating agencies, and what would be most helpful moving forward to the regulatory agencies and its consultants to facilitate review and assessment of future Navy deliverables:

1. A comprehensive database in Microsoft Access or another common format, together with database documentation including:
 - a. Either a database model, data structure diagram or relational diagram explaining the relationships between common fields in the database tables
 - b. A description of the contents of the fields of each of the database tables
2. Major data tables including the following:
 - a. A master location data table, including geographic information for the location and elevations of all samples / other data included in the database and inclusive of recent survey updates
 - b. A master well construction table, including details of the “as-built” construction of all wells possessing data in the database, including measuring point elevations used for water level measurements throughout time
 - c. A drilling activity/data table, including information regarding past and current / recent drilling activities, including soil boring logs
 - d. A data table containing borehole lithology data (interpretation of stratigraphic “pics”, for example)
 - e. One or more data tables containing static (e.g., manual) groundwater level data, typically reporting liquid levels where LNAPL is present
 - f. One or more data tables containing continuous (e.g., datalogger) groundwater level data, typically reporting liquid levels where LNAPL is present
 - g. One or more soil gas data tables, containing soil gas survey data
 - i. Multiple tables are sometimes needed for differing analyte suites, but where possible, a unified data table is preferred (global comment)

- h. One or more tables containing groundwater sample test results, including biodegradation parameters and isotopic analyses
 - i. One or more tables containing soil/matrix analytic sample test results
 - j. One or more tables containing sample test result QC such as obtained from (a) the testing laboratory or (b) the data validation process
 - k. One or more tables relating individual samples to the batch identifier
 - l. One or more tables containing pumping / flow rate data from wells and shafts
 - m. One or more tables containing hydraulic conductivity profiling data and results
 - n. One or more tables containing petrophysical core sampling results
 - o. One or more tables quantifying the geologic/lithologic materials are all available locations; alternatively, if the quantitative geologic model is in an alternate format, that can be provided
3. Major queries including the following: (if data are properly organized, we can write our own queries, would lessen our ask)
- a. Queries used to select data for use in preparation of synoptic water level maps
 - b. Queries used to select data for use in preparation of time-series chemical and water level time-series graphs

Example Database Guidelines

Many example database guidelines and proposed structures exist. Below are a couple of useful sites and resources related to environmental database structures:

1. U.S. EPA Region 5 EDD Comprehensive Specification Manual (Version 4.1):

Available at: [HYPERLINK "https://www.epa.gov/sites/production/files/2016-08/documents/r5comprehensivemanual_aug2016.pdf"]

2. EQUIS Database system:

Information available at: [HYPERLINK "<http://help.earthsoft.com/default.asp?W1644>"]

3. A useful resource and publication regarding data types:

Available at: [HYPERLINK "<https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2007WR006392>"]